

# **Sea Level Rise Risks and Opportunities**

## **Integrated Climate Adaptation and Resiliency Program**

**12 OCT 2018**



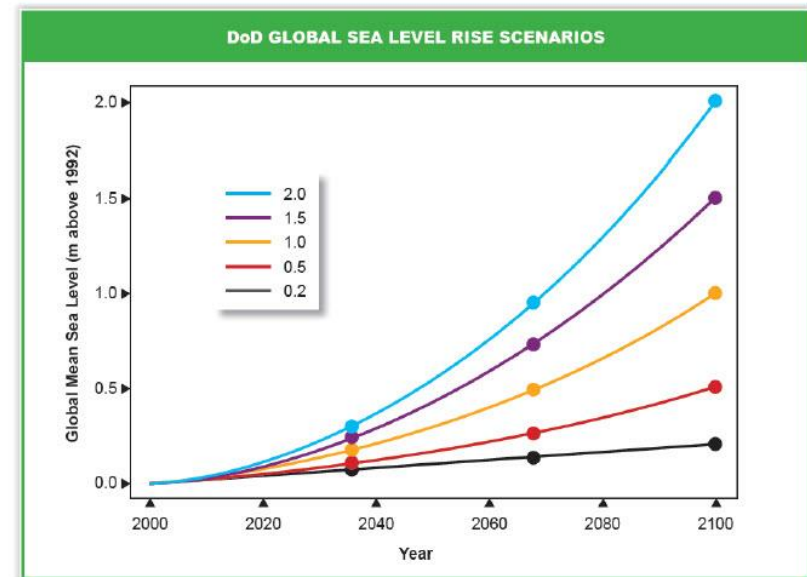
# Background: Navy Region Southwest



- **6 state area of operations**
- **10 Naval Installations (1.4 million acres)**
- **18 reserve centers**
- **64 ships and 556 aircraft with associated air, sea, and land ranges**
- **480 tenant commands**
- **13,206 housing units owned, leased, or public-private ventures**
- **10,000 personnel – 391,000 military, dependents, retirees**
- **11,907 buildings & 8,878 other structures**
- **18 runways**
- **57 piers**
- **3 islands**

# Issue: Sea Level Rise

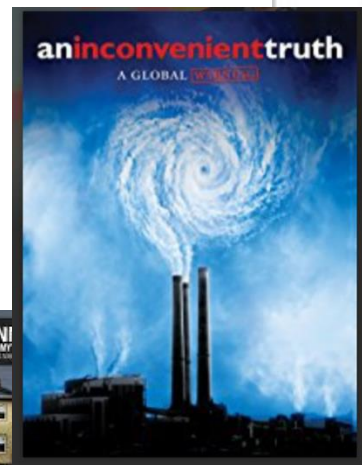
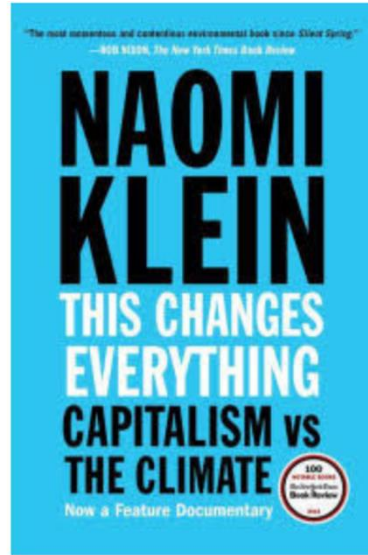
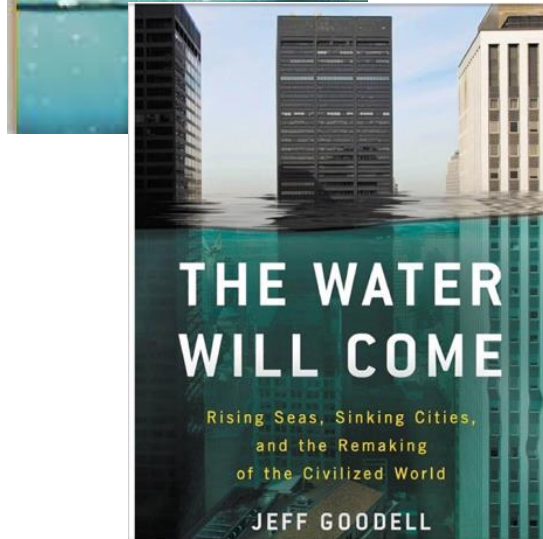
- Global sea levels are expected to rise between 0.2 meters and 2.0 meters by 2100.
- Coastal damage increases when waves and storm surge occur during high tides.
- NRSW Coastal installations are expected to experience damage from increased wave activity.
- Potential impacts to critical facilities and other infrastructure.



Five Global Sea-Level Rise Scenarios Advanced in Support of this Database



# Media Reports of Sea Level Rise



# Department of Defense Policy Statement



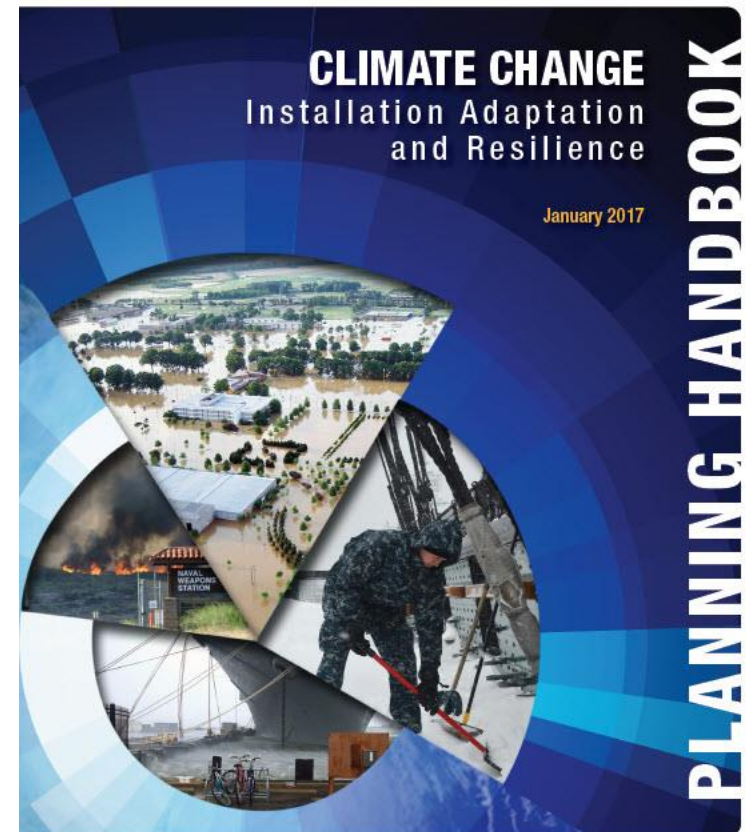
**Department of Defense Secretary Mattis has said climate change is not a mission of the Department of Defense.**

**The Department evaluates a variety of threats and risks to the mission, of which effects of a changing climate are one, and uses that information to assess impacts and identify responses.**

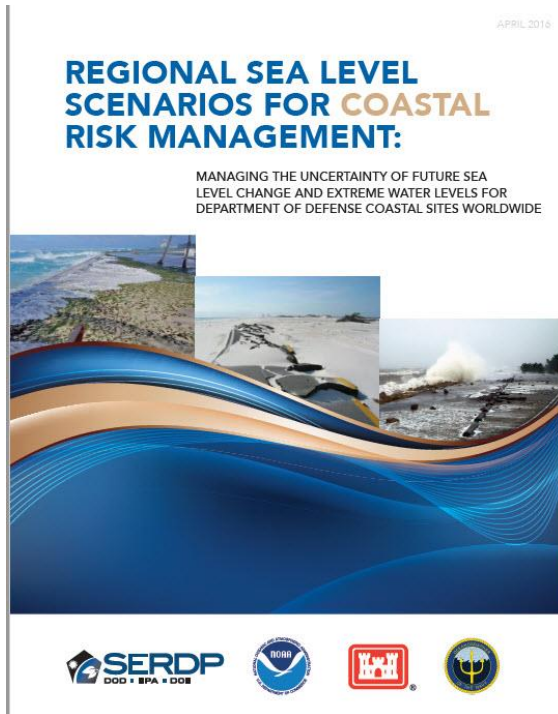
**The Department's focus is on all potential threats that impact mission readiness, personnel health, and installation resilience.**

# Existing Policies/Guidance

- **UFC 2-100-01 Installation Master Planning (2012)**
- **DoD Climate Change Adaptation Roadmap (2014)**
- **DoD Directive 4715.21 Climate Change Adaptation and Resilience (2016)**
- **NAVFAC Navy Climate Change Installation Adaptation and Resilience Planning Handbook**
- **National Defense Authorization Act (2018)**



# Recently Completed Studies and Datasets

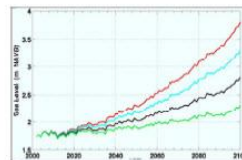


## A Methodology for Assessing the Impact of Sea Level Rise on Representative Military Installations in the Southwestern United States (RC-1703)

Final Report

Submitted to:  
The Strategic Environmental Research and Development Program

March 2014



Submitted by:  
Dr. Bart Chadwick (Principal Investigator)  
SPAWAR Systems Center Pacific

In Collaboration with:  
TerraCosta Consulting Group  
University of California San Diego: San Diego Supercomputer Center  
US Geological Survey  
Moffatt & Nichol

- **ASN (Environment) has endorsed joint studies and data provided by:**
  - Army Corps of Engineers (USACE);
  - National Oceanic and Atmospheric Administration (NOAA);
  - Navy Oceanography; and
  - Strategic Environmental Research and Development Program (SERDP)



# SERDP Scenarios



## Regionalized Sea Level Change & Extreme Water Level Scenarios

Online Graphical  
User Interface  
(GUI) User Guide

User Guide v2.0

April 2016

Department of Defense (DoD)



### Case Studies – Inundation Mapping and Tidal Surface Considerations

- The Hall et al. (2016) report accompanying this database contains guidance on incorporating considerations related to inundation mapping error and tidal surface variation when analyzing the potential impact of SLR and EWL scenarios.
- Section 4.5.3 and Section 5.2.3 contained associated discussion (See slide 7 for where to find the report)

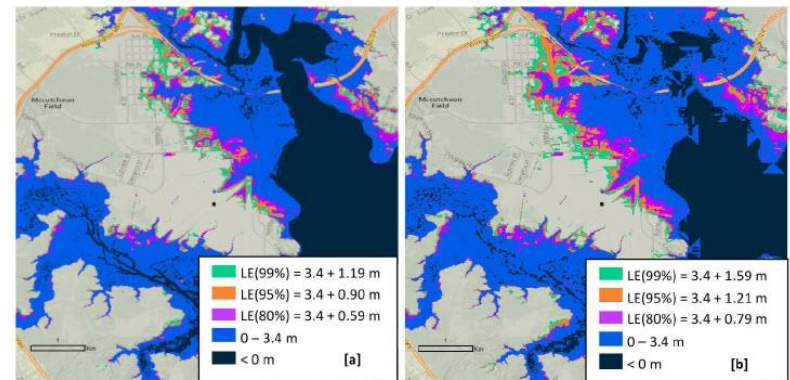


Figure 5.10 MCBCL West Site 3.4-Meter Inundation Map  
([a] NED 1/9 arc-second DEM dataset; [b] NED 1/3 arc-second DEM dataset)

### Combined - Data

- The page includes four buttons, one for each EWL return
- Clicking any of these four buttons displays the corresponding
- Multiple Gauge (RFA) and/or Single Gauge data will be displayed

20% Annual Chance Event  
["6 Year Event"]

5% Annual Chance Event  
["20 Year Event"]

% chance in any given year that there will be

Values in the tables below represent elevations above the reference datum for the combination of sea level change scenario and the selected annual chance event.

### Based on Multiple Gauge Analysis

Global Scenario	2035	2065	2100
0.2 - Lowest	2.0	2.1	2.3
0.5 - Low	2.0	2.3	2.7
1.0 - Medium	2.1	2.5	3.3
1.5 - High	2.2	2.7	3.8
2.0 - Highest	2.3	3.0	4.5

Base Unit → Meters

### Based on Single Gauge Analysis

No Single Gauge data is available for this site

This means that for the 1.5-meter (High) scenario, the combination of regionally adjusted SLR and the EWL associated with the 20% annual chance event (or 5-Year Event) would reach an elevation of 3.8 meters in 2100, compared to the 1992 baseline.

# NAVFAC SW GIS SLR Analysis

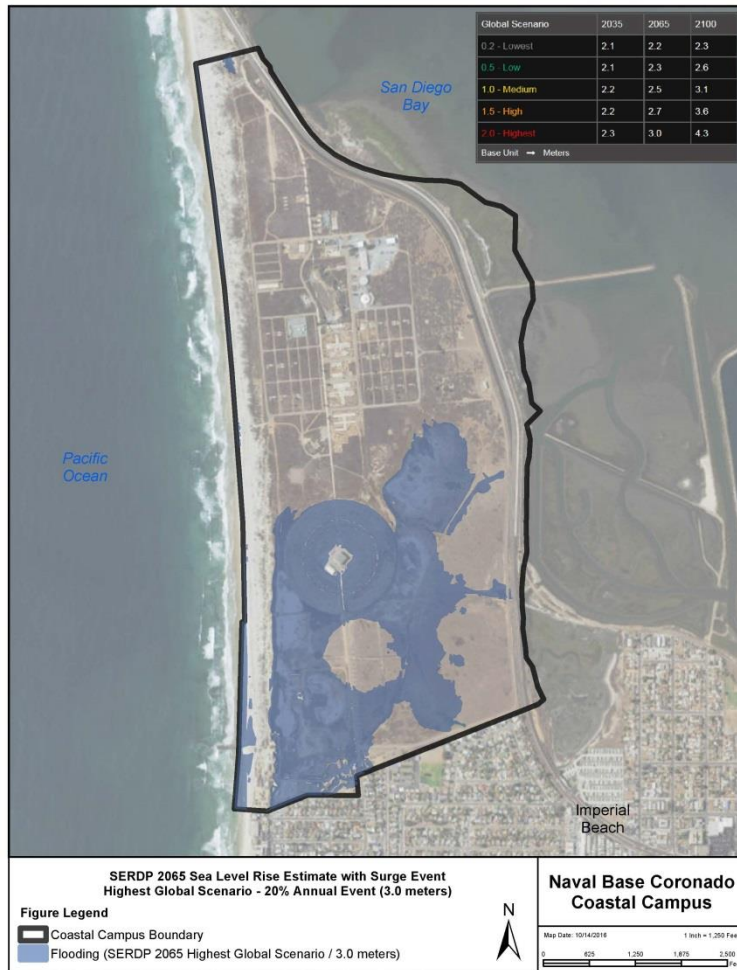


- **Following slides include GIS maps illustrating and comparing the following:**
- **20% (once every 5 years) SLR combined with storm surge 2035, 2065 and 2100;**
- **1% (once every 100 years) SLR combined with storm surge 2035, 2065 and 2100;**

# Year 2035: 20% and 1% SLR Coastal Campus

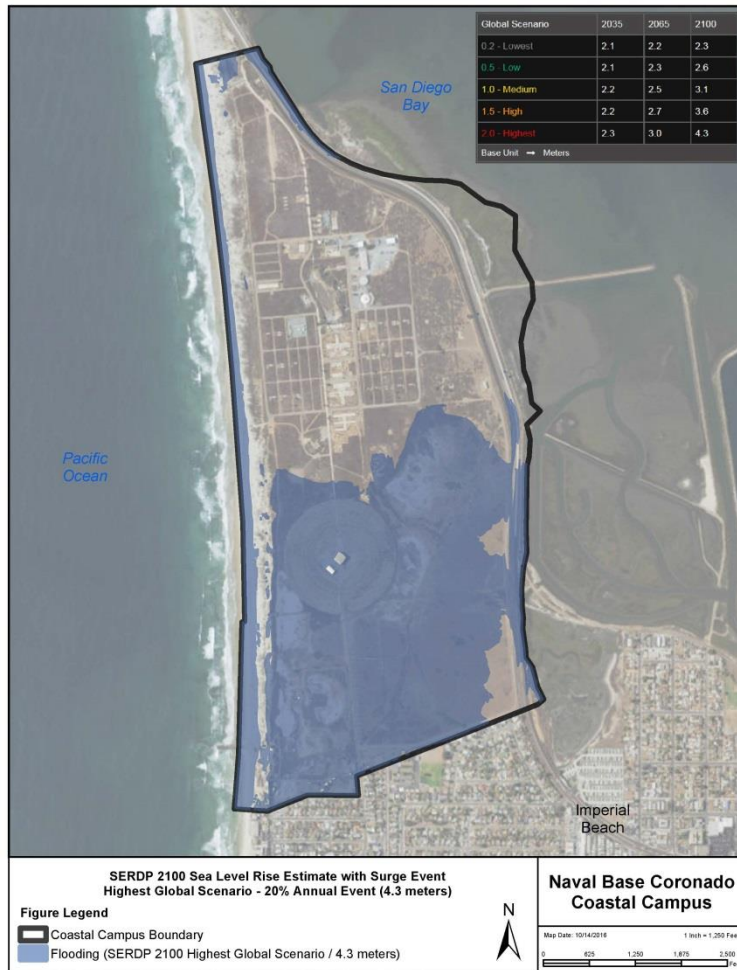


# Year 2065: 20% and 1% SLR Coastal Campus





# Year 2100: 20% and 1% SLR Coastal Campus





# Way Forward



- **Utilize existing data sources to develop sea level rise scenarios for NRSW coastal installations.**
- **Conduct vulnerability and risk assessments.**
- **Establish protection, resiliency and adaptation strategies.**
- **Integrate into short, medium and long-range plans.**
- **Use updated design guidance for future construction.**
- **Engage with City of San Diego, City of Coronado, SANDAG, Port of San Diego, and other agencies to share efforts related to sea level rise.**

# Collaboration

(NRSW-Port MOA, NOAA/Scripps, Climate Security Conference)



# Adaptation Opportunities



- **Water Security: Water Conserving Systems and Fixtures, Drought Tolerant Landscaping**
- **Civil and Structural Engineering: Sea Walls, Building Foundations, Retention Basins**
- **Architecture: Building Retrofit, Protection and Adaptation Designs**
- **Landscape Architects/Biologists: Habitat/Wetland Restoration, Drought Tolerant/Fire Resistant Plant Materials**

# Questions

